5.2% efficient PbS nanocrystal Schottky solar cells

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Supporting Information

5.2% Efficient PbS Nanocrystal Schottky Solar Cells

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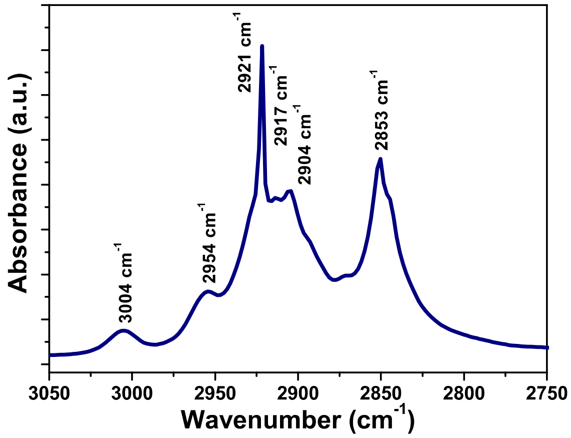

Figure S1. FTIR spectra for *PbS_3 washing steps*: the peaks at 2921 cm^{-1}, 2917 cm^{-1}, 2904 cm^{-1} and 2853 cm^{-1} are assigned to antisymmetric and symmetric methylene stretch modes ($\nu_{(as)}CH_2$, $\nu_{(s)}CH_2$).

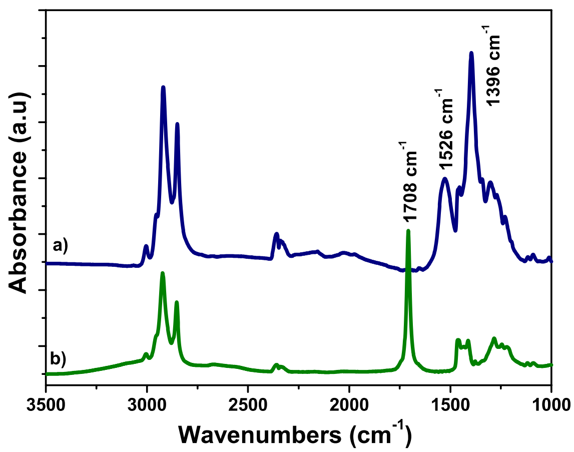

Figure S2: FTIR spectra for a) *PbS_4 washing steps* the wavenumbers separation between $\nu_{as}(COO^-)$-1526 cm^{-1} and $\nu_s(COO^-)$-1396 cm^{-1} is 130 cm^{-1} and it can be assigned to a bidentate coordination. b) Oleic acid: the peak at 1708 cm^{-1} corresponds to the C=O stretching of carboxylate in acidic form.

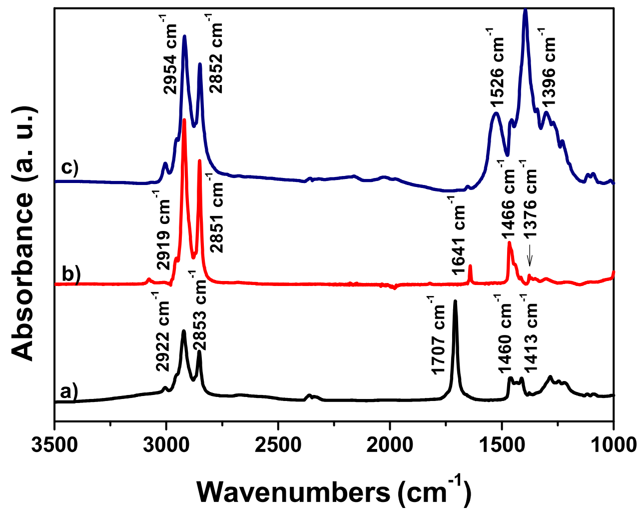

Figure S3. FTIR spectra for *a) oleic acid*: 2922 cm^{-1} –ν_{as}(C-H in CH_2 and CH_3), 2853 cm^{-1} – νs(C-H in CH_2), 1707 cm^{-1} ν(C=O)-acidic form, 1460 cm^{-1}, 1413 cm^{-1} - δ(C-H in CH_2)-bending and scissoring vibration mode, *b) octadecene:* 2919 cm^{-1} -ν_{as}(C-H in CH_2 and CH_3), 2851 cm^{-1} – ν_s(C-H in CH_2), 1641 cm^{-1} ν(C=C)-, 1466 cm^{-1} ν(C-H in CH_2)-bending vibrations, 1376 cm^{-1} umbrella type of vibration, *c) PbS_4 washing steps*: 2954 cm^{-1} -ν_{as}(C-H in CH_2 and CH_3), 2852 cm^{-1} –νs(C-H in CH_2) ν_{as}(COO^-)-1526 cm^{-1} and ν_s(COO^-)-1396 cm^{-1}.

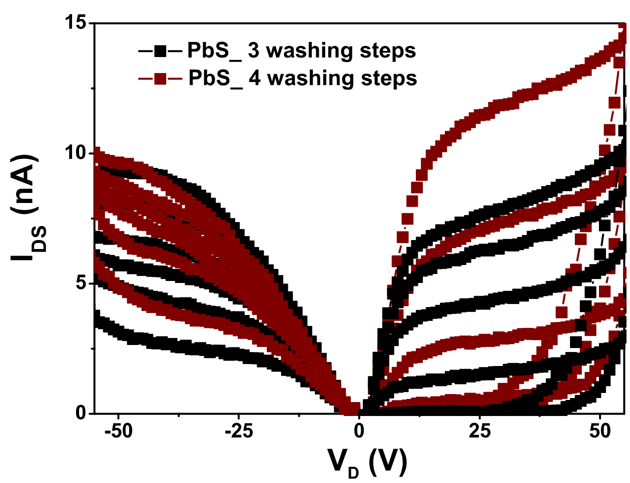

Figure S4 p-channel and n-channel I_D-V_D output characteristics of FETs of PbS colloidal nanocrystal fabricated using solutions with 3 and 4 washing steps. The electron mobilities, extracted from the transfer curves in saturation regimes are: *PbS_3 washing steps* 1.2 x 10^{-5} cm^2/Vs and *PbS_3 washing steps* 2 x 10^{-5} cm^2/Vs.

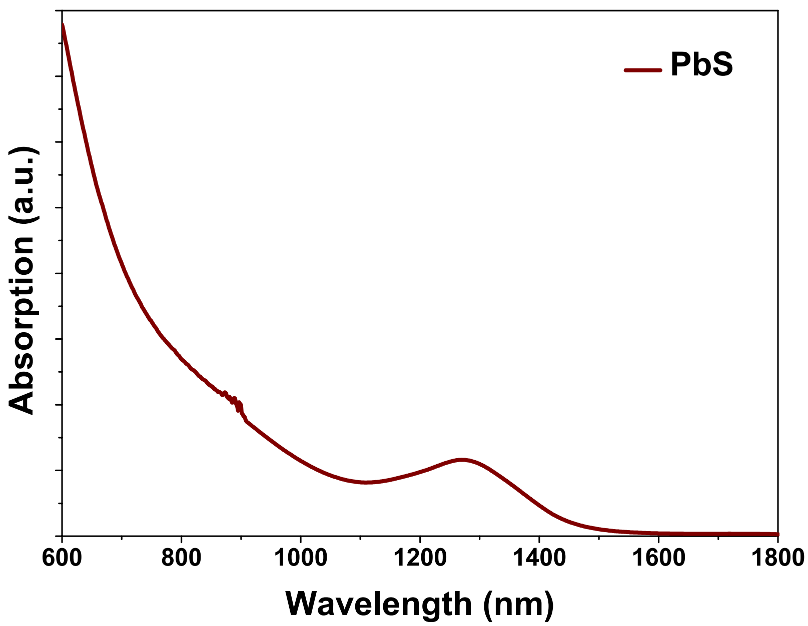

Figure S5 Absorption spectra of OA-capped PbS nanocrystals dispersed in chloroform.

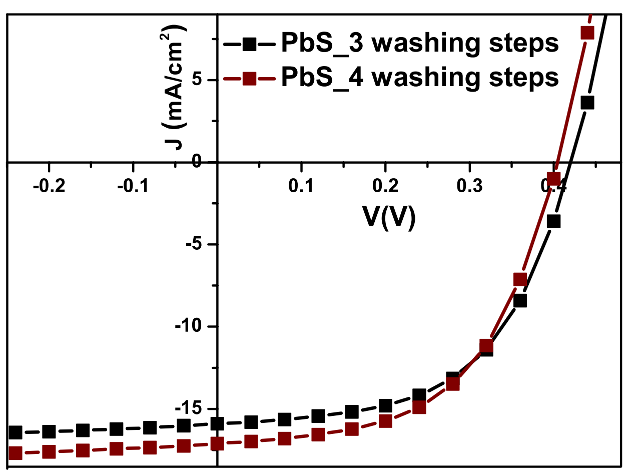

Figure S6 *J-V* current-voltage characteristics of the devices realized from PbS solutions with 3 and 4 washing steps.

Table 1. Comparison of performance parameters between solar cells fabricated from the solutions of PbS nanocrystal that have been washed three times and four times

	V_{OC} (V)	J_{SC} (mA/cm^2)	FF (%)	PCE (%)
PbS_3 washing steps	0.42	-15.9	55	3.7
PbS_4 washing steps	0.4	-17.2	55	3.8